
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA-16003 (June 2004)
NASA
Superseding NASA-16003
(December 2003)

SECTION TABLE OF CONTENTS

DIVISION 16 - ELECTRICAL

SECTION 16003

GENERAL ELECTRICAL PROVISIONS

06/04

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SUBMITTALS
- 1.3 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS
- 1.4 CODES AND STANDARDS
- 1.5 COORDINATION
- 1.6 APPROVAL REQUIREMENTS
- 1.7 PREVENTION OF CORROSION
- 1.8 HAZARDOUS AREA

PART 2 PRODUCTS

- 2.1 IDENTIFICATION PLATES
- 2.2 WARNING SIGNS
- 2.3 ANCHOR BOLTS
- 2.4 SEISMIC ANCHORAGE
- 2.5 PAINTING

PART 3 EXECUTION

- 3.1 INSTALLATION
- 3.2 PAINTING APPLICATION
- 3.3 IDENTIFICATION PLATE INSTALLATION
- 3.4 EQUIPMENT PADS
- 3.5 CUTTING AND PATCHING
- 3.6 DAMAGE TO WORK
- 3.7 CLEANING
- 3.8 FIELD TESTING AND TEST EQUIPMENT

-- End of Section Table of Contents --

NASA-16003 (June 2004)
NATIONAL AERONAUTICS NASA
AND SPACE ADMINISTRATION Superseding NASA-16003
(December 2003)

SECTION 16003

GENERAL ELECTRICAL PROVISIONS
06/04

NOTE: Delete, revise, or add to the text in this
section to cover project requirements. Notes are
for designer information and will not appear in the
final project specification.

This section covers requirements common to all
electrical sections and should be included in all
project specifications which contain any sections of
Division 16, "Electrical," with the exception of
Section 16050 BASIC ELECTRICAL MATERIALS AND METHODS
which stands alone: Accordingly, this section
should be tailored carefully to suit project
conditions and to meet project requirements and must
be checked with Division 1 to avoid conflicts or
repetition.

PART 1 GENERAL

1.1 REFERENCES

NOTE: The following references should not be
manually edited except to add new references.
References not used in the text will automatically
be deleted from this section of the project
specification.

The publications listed below form a part of this section to the extent
referenced:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z535.1 (2002) Safety Color Code

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2002) Standard Specification for Zinc
(Hot-Dip Galvanized) Coatings on Iron and
Steel Products

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (2002) National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

MS MIL-T-704 (Rev K) Treatment and Painting of Material

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS A-A-59214 (2004) Junction Box: Extension, Junction Box; Cover, Junction Box (Steel, Coated With Corrosion-Resistant Finish)

UNDERWRITERS LABORATORIES (UL)

UL Elec Const Dir (2003) Electrical Construction Equipment Directory

1.2 SUBMITTALS

Not Used

NOTE: Insert only those submittals which cover multiple sections within Division 16. Edit those submittals out of the referenced sections.

1.3 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

It is the intent of these specifications and the contract drawings to provide a complete and workable facility.

Design drawings are diagrammatic and do not show all offsets, bends, elbows, or other specific elements that may be required for proper installation of the work. Such work shall be verified at the site. Additional bends and offsets, and conduit as required by vertical and horizontal equipment locations or other job conditions, shall be provided to complete the work at no additional cost to the Government.

Except where shown in dimensional detail, the locations of switches, receptacles, lights, motors, outlets, and other equipment shown on plans are approximate. Such items shall be placed to eliminate interference with ducts, piping, and equipment. Exact locations shall be determined in the field. Door swings shall be verified to ensure that light switches are properly located.

Equipment sizes indicated are minimum. Before installing any wire or conduit, the Contractor shall obtain the exact equipment requirements and shall install wire, conduit, disconnect switches, motor starters, heaters, circuit breakers, and other items of the correct size for the equipment actually installed. Wire and conduit sizes shown on the drawings shall be taken as a minimum and shall not be reduced without written approval.

1.4 CODES AND STANDARDS

Equipment design, fabrication, testing, performance, and installation

shall, unless shown or specified otherwise, comply with the applicable requirements of NFPA 70 and IEEE C2 to the extent indicated by the references.

1.5 COORDINATION

Installation of the electrical work shall be coordinated with the work of other trades.

1.6 APPROVAL REQUIREMENTS

Where materials and equipment are specified to conform to the standards of the Underwriters Laboratories (UL), Inc., the label of, or listing with re-examination, in UL Elec Const Dir will be acceptable as sufficient evidence that the items conform to the requirements.

Where materials or equipment are specified to be constructed or tested in accordance with the standards of NEMA, ANSI, ASTM, or other recognized standards, a manufacturer's certificate of compliance indicating complete compliance of each item with the applicable NEMA, ANSI, ASTM, or other commercial standards specified will be acceptable as proof of compliance.

1.7 PREVENTION OF CORROSION

NOTE: For all outdoor applications and all indoor applications in a harsh environment refer to Section 09960 HIGH PERFORMANCE COATINGS. High performance coatings are specified for all outdoor applications because ultraviolet radiation will break down most standard coatings, causing a phenomena known as chalking, which is the first stage of the corrosion process. For additional information contact The Coatings Industry Alliance, specific suppliers such as Keeler and Long and PPG, and NACE International (NACE).

Metallic materials shall be protected against corrosion. Equipment enclosures shall be given a rust-inhibiting treatment and the standard finish by the manufacturer when used for most indoor installations. For harsh indoor environments (any area subjected to chemical and/or abrasive action), and all outdoor installations, refer to Section 09960 HIGH PERFORMANCE COATINGS.. Aluminum shall not be used in contact with earth or concrete. Dissimilar metals in intimate contact shall be protected by approved fittings, barrier material, and treatment. Ferrous metals such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion-resistant steel or nonferrous materials shall be hot-dip galvanized in accordance with ASTM A 123/A 123M for exterior locations and cadmium-plated in conformance with FS A-A-59214 for interior locations.

1.8 HAZARDOUS AREA

Electrical work within any hazardous location shall meet the applicable requirements of NFPA 70, Chapter 5, Articles 500 through 517. The following definitions apply:

Explosionproof: A receptacle, fixture, device, or equipment enclosure

that is designed to withstand explosion of a specified liquid, gas, vapor, or dust within the enclosure and to prevent the ignition of a specified gas, vapor, or dust surrounding the enclosure by sparks, flashes, or explosions of the specified liquid, gas, vapor, or dust that may occur within the enclosure. Enclosure shall be capable of operating at an external temperature that will not ignite a surrounding flammable atmosphere.

Hazardous location: An area where ignitable vapors or dust may cause a fire or explosion created by energy emitted from lighting or other electrical equipment or by electrostatic generation.

NFPA 70, Article 500-2 lists chemical atmospheres by groups A, B, C, and D. In addition, although not defined as a hazardous material by the NEC, oxygen concentrations (liquid and gaseous) are considered to provide a hazard because of the increased flammability of materials exposed to oxygen. Therefore, oxygen concentrations shall be classified under Group D.

PART 2 PRODUCTS

2.1 IDENTIFICATION PLATES

Identification plates shall be [3-layer white-black-white] [2-layer black-white], engraved to show black letters on a white background. Letters shall be uppercase. Identification plates 1-1/2 inches 40 millimeter high and smaller shall be 1/16-inch 2 millimeter thick with engraved lettering 1/8-inch 3 millimeter high. Identification plates larger than 1-1/2 inches 40 millimeter high shall be 1/8-inch 3 millimeter thick with engraved lettering not less than 3/16-inch 5 millimeter high. Identification plates having edges of 1-1/2 inches 40 millimeter high and larger shall be beveled.

2.2 WARNING SIGNS

Each item of electrical equipment operating at 480 volts and above shall be provided with conspicuously located warning signs conforming to the requirements of Occupational Safety and Health Agency (OSHA) standards.

Any equipment with externally powered wiring shall be marked with a laminated plastic nameplate having 3/16-inch 5 millimeter high white letters on a red background as follows:

DANGER - EXTERNAL VOLTAGE SOURCE

Safety color coding for identification of warning signs shall conform to ANSI Z535.1.

2.3 ANCHOR BOLTS

Anchor bolts shall be provided for equipment placed on concrete equipment pads or slabs.

2.4 SEISMIC ANCHORAGE

NOTE: Retain this part only in areas of seismic
activity.

Electrical equipment, except communications, emergency, and standby equipment, shall be anchored to withstand a lateral force of 0.3 times the weight of the equipment.

Communications, emergency, and standby equipment shall be anchored to withstand a lateral force of 0.6 times the weight of the equipment.

The following standard anchoring should be adequate for equipment not classified as communications, emergency, or standby:

Dry transformers - floor-mounted with four anchor bolts

BOLT DIAMETER

Under 150 kVA	-	3/8 M10
150 to 500 kVA	-	1/2 M14
Over 500 kVA	-	5/8 M16

Panels - floor-mounted with four 1/2-inch M14 diameter anchor bolts

2.5 PAINTING

Enclosures of the following listed items shall be cleaned, primed, and factory-painted inside and outside in accordance with MS MIL-T-704 and the equipment sections of this specification. [Refer to Section 09960 HIGH PERFORMANCE COATINGS, for requirement for outdoors or in harsh environments.]

ITEM	FINISH COLOR
Circuit Breakers	ANSI No. 61 gray
Substations	ANSI No. 61 gray
Switchgear	ANSI No. 61 gray
Transformers	ANSI No. 61 gray
Safety Switches	Manufacturer's standard
Panelboards	Manufacturer's standard
Electric Heaters	Manufacturer's standard
Motors	Manufacturer's standard
Limit Switches	Manufacturer's standard
Control Components	Manufacturer's standard

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be accomplished by workers skilled in this type of work. Installation shall be made so that there is no degradation of the designed fire ratings of walls, partitions, ceilings, and floors. Except as otherwise indicated, emergency switches and alarms shall be installed in conspicuous locations.

3.2 PAINTING APPLICATION

Exposed conduit, supports, fittings, cabinets, pull boxes, and racks, if

not factory painted, shall be thoroughly cleaned and painted as specified in [Section 09920 ARCHITECTURAL PAINTING] [the equipment sections in this specification] unless otherwise noted. Work shall be left in a neat and clean condition at final completion of the contract.

Emergency equipment, such as fire-alarm boxes, shall be cleaned, primed, and painted red.

3.3 IDENTIFICATION PLATE INSTALLATION

Identification plates shall be fastened by means of corrosion-resistant steel or nonferrous metal screws. Hand lettering, marking, or embossed self-adhesive tapes are not acceptable.

3.4 EQUIPMENT PADS

Equipment pads shall be constructed with a minimum 4-inch 100 millimeter margin around the equipment and supports.

3.5 CUTTING AND PATCHING

Contractor shall install his work in such a manner and at such time as will require a minimum of cutting and patching on the building structure.

Holes in or through existing masonry walls and floors in exposed locations shall be drilled and smoothed by sanding. Use of a jackhammer will be permitted only where specifically approved.

3.6 DAMAGE TO WORK

Required repairs and replacement of damaged work shall be done as directed by and subject to the approval of the Contracting Officer, and at no additional cost to the Government.

3.7 CLEANING

Exposed surfaces of wireways, conduit systems, and equipment that have become covered with dirt, plaster, or other material during handling and construction shall be thoroughly cleaned before such surfaces are prepared for final finish or painting or are enclosed within the building structure.

Before final acceptance, electrical equipment, including lighting fixtures and glass, shall be clean and free from dirt, grease, and fingermarks.

3.8 FIELD TESTING AND TEST EQUIPMENT

All Field testing specified in Divisions 16 electrical specification shall be made with test equipment specially designed and calibrated for the purpose. Test equipment used shall be calibrated and certified by an approved testing laboratory. Date of last calibration and certification shall not be more than 90 calendar days old at the time of field testing.

-- End of Section --